



Research Institute for Mathematical Sciences - Kyoto University

# HOMOTOPICAL ALGEBRAIC & ARITHMETIC GEOMETRY

Seven Topics of Homotopic Arithmetic Geometry – 七福話

First Semester 2020-2021

京都大学

Organizers: B. Collas, RIMS - Kyoto University & K. Sawada - Osaka University.

The goal of this *virtual seminar* is for PhD and postdoctoral researchers to strengthen their expertise on a specific point of their research field, or to broaden their arithmetic geometry culture.

The programme is organized in **7 topics around Grothendieck's conjectures** that are (1) the existence of sections and rational points (T1 & T6), and (2) some potential obstructions to anabelian phenomenon (T4 & T5). Our approach follows the **étale homotopy type and  $\mathbb{A}^1$ -geometry**, whose *simplicial and homotopical techniques* provides some complementary approaches via higher homotopy groups and cohomology theories.

An additional grounding is provided by 3 seminal arithmetic constructions whose common aspect is the consideration of **anabelian constructions in higher dimensions or for higher symmetries**.

## Topic 1

**Rational Obstruction:** the local-global principle, from Brauer groups to étale homotopy type.

\*

## Topic 2

**Compactification of Moduli Stacks of Curves:** Deligne-Mumford stable compactification and Kato log-geometry.

\*

## Topic 3

**Good Reduction Criteria in Anabelian Geometry:** Via Oda's and Tamagawa's central series for hyperbolic and poly-curves.

## Topic 4

**$\mathbb{A}^1$ -Homotopy Theory and Anabelian Geometry:** Morel-Voevodsky's unstable motivic homotopy factorizes the étale homotopy type.

## Talk 5

**Spectral Methods in Motivic Theory:** Stable motivic homotopy and universal cohomology.

\*

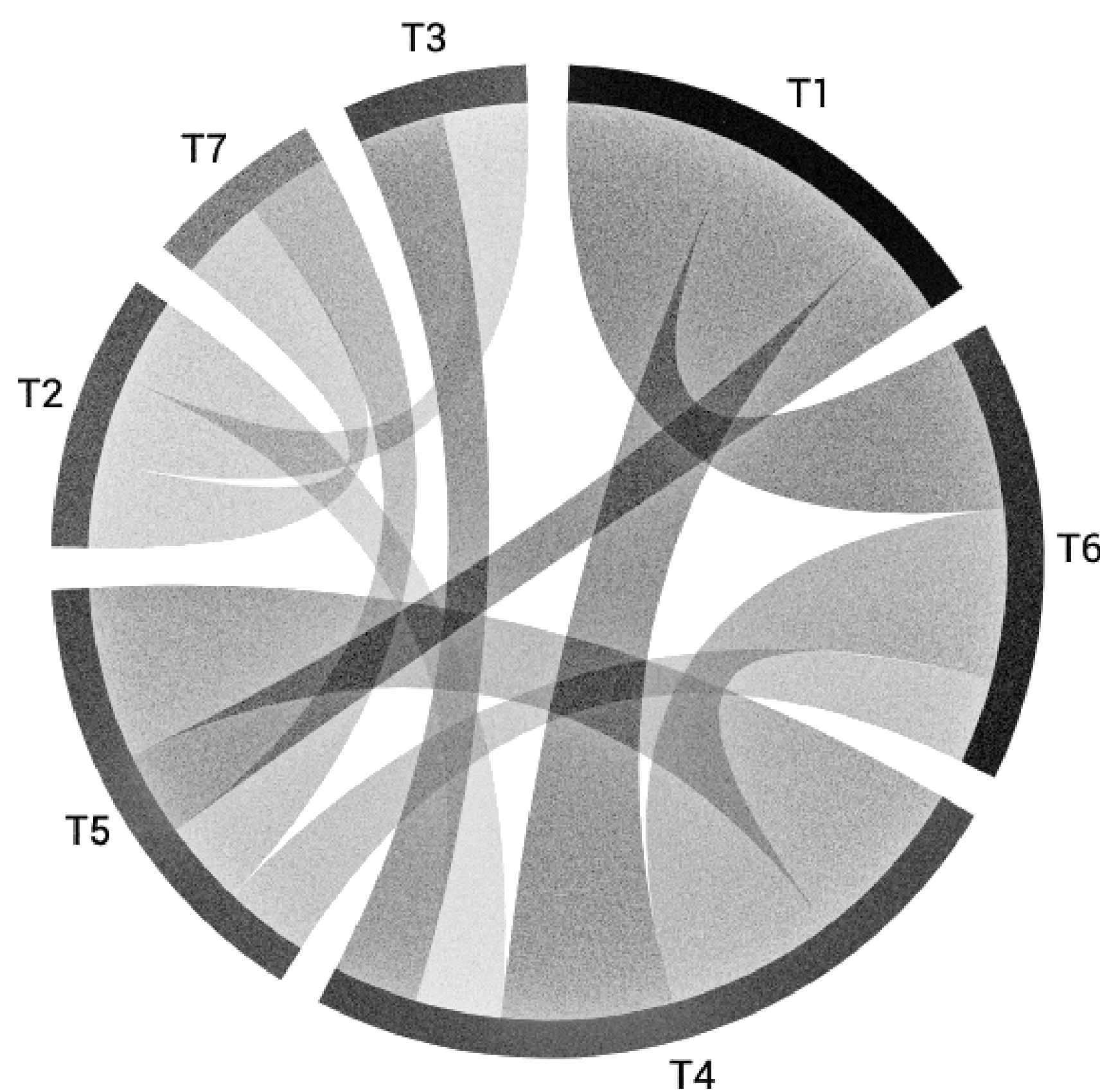
## Topic 6

**The Section Conjecture:** A new formulation in terms of étale homotopy type and homotopy limit problem.

\*

## Topic 7

**Arithmetic of  $G$ -covers:** Field of moduli vs Field of definition, via gerbes and Giraud's non-abelian cohomology theory.



Interconnections of topics in terms of Grothendieck's anabelian and section conjectures,  $\mathbb{A}^1$ -homotopy and étale topological type, higher symmetries and dimensions, abelian and non-abelian methods.

The **Homotopic and Arithmetic Geometry Seminar** takes place every two weeks by Zoom and is addressed to PhD and postdoctoral researchers interested in classical and homotopical algebraic geometry. It is expected for speakers to illustrate fundamental notions via geometric motivations and key examples. Please refer to the website for schedule and detailed programme; contact the organizers for attending or giving a talk or registration to the Zoom group chat.

